

可靠性测试报告

| | |
|-------|---------------------------|
| 产品名称: | TB-05 |
| 产品型号: | <u>蓝牙系列</u> |
| 测试日期: | 2023.8.7-2023.8.15 |
| 测试人: | 赖宗生 |
| 审核人: | 卢信桂 |

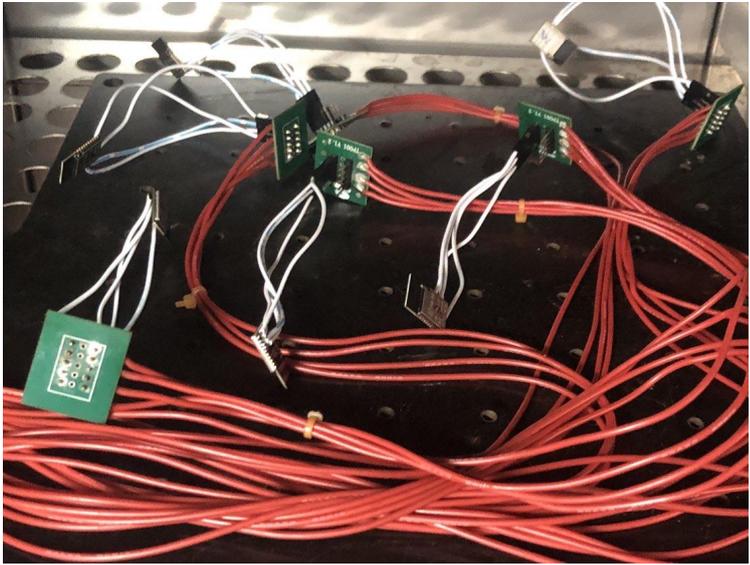
1. 检验标准

| 序号 | 工序名称 | 检验项目 | 检验工具 | 抽样水平(参考 GB/T 2828.1-2012) | 允收水准 | | |
|----|-------|------------------------------|---------|---------------------------|----------|----------|----------|
| | | | | | CR(致命缺陷) | MA(严重缺陷) | MI(轻微缺陷) |
| 1 | 可靠性测试 | 高低温存储/高常低温关机/高低温运行/交变湿热/冷热冲击 | 恒温恒湿试验机 | 正常一次抽样, 特殊检验 S-1 | 0 收 1 退 | | |

2. 试验项目

| 编号 | 项目 | 测试条件 | 测试周期 |
|----|--|---|-------|
| 1 | 低温存储测试 (Low temperature storage test) | 测试条件: -40°C 测试时间: 8hr 在 -40°C 下停留8hr后, 做冷启动测试. | 12hrs |
| 2 | 高温储存测试 (High temperature storage test) | 测试条件: $100^{\circ}\text{C} +93\%\text{RH}$ 测试时间: 8hrs 恢复到 85°C 停留1hr后, 做热启动测试. | 12hrs |
| 3 | 低温运行测试 (Low temperature operation test) | 测试条件: -40°C 测试时间: 24hrs | 24hrs |
| 4 | 高温运行测试 (High temperature operation test) | 测试条件: $85^{\circ}\text{C} +93\%\text{RH}$ 测试时间: 24hrs | 24hrs |
| 5 | 开关机测试 (AC power on/off test with temperature) | A) 温度: -40°C . B) 温度: $25^{\circ}\text{C} +93\%\text{RH}$ C) 温度: $85^{\circ}\text{C} +93\%\text{RH}$ 每个条件循环 200次, 开30sec, 关30sec | 12hrs |
| 6 | 交变湿热测试 (Alternating hot and humid test) | A) $85^{\circ}\text{C} +93\%\text{RH}$ 运行4hrs; B) $25^{\circ}\text{C} +93\%\text{RH}$ 运行4hrs; 循环步骤A步骤B总共2个循环. | 16hrs |
| 7 | 冷热冲击测试 (Thermal shock test) | 测试条件: $-40^{\circ}\text{C} \sim 100^{\circ}\text{C} +93\%\text{RH}$, 每个温度停留30mins, 温度变换时间为升温50mins, 降温2hrs. 测试时间: 循环5cycles | 22hrs |

3. 试验准备

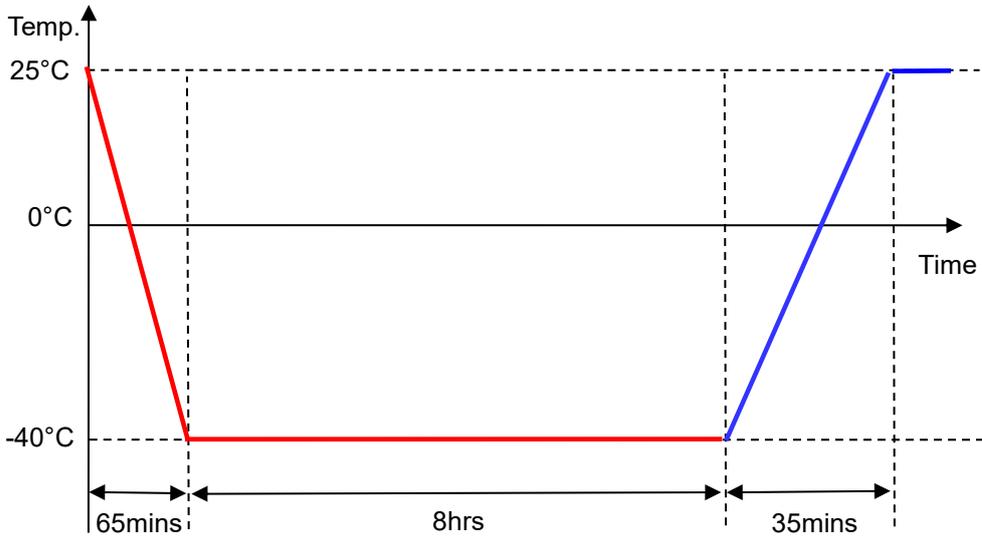
| 编号 | 项目 | 图片/附件 |
|----|---------|--|
| 1 | 可靠性说明文档 | 参考TB-05模组可靠性说明 |
| 2 | 实验设备 |  |
| 3 | 样品摆放 |  |
| 4 | 测试原因 | 客户要求做可靠性测试 |

4. 低温存储测试 (Low temperature storage test)

测试条件: 关机测试, 让产品储存在-40° C下保持8hrs, 然后做冷启动测试.

测试曲线:

Is Power Off ————
Is Power On ————



测试标准:

1. 冷启动时功能正常, 用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
2. 产品测试完后没有可见的损伤, 如收缩、剥离、变色等现象。

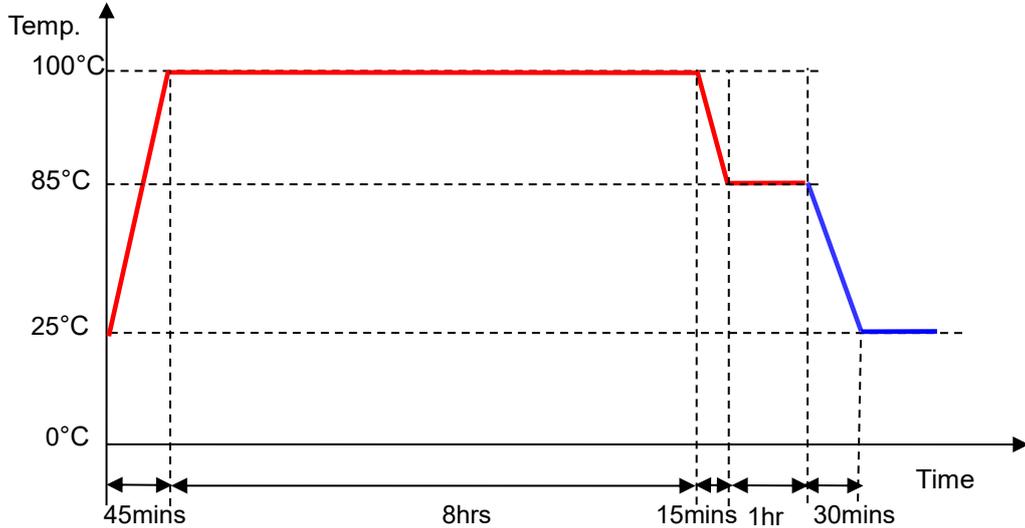
| 测试样机 | 测试数据 | 测试结果 |
|------|--|------|
| 6PCS | <p>The screenshot shows a 'Scanner' app interface with a 'Stop Scanning' button at the top right. Below the title, it says 'Filtering Active (6 / 12)'. There are six device entries, each with a Bluetooth icon, a MAC address, a signal strength indicator, and a 'Connect' button. The devices are: SGBP-604CB074 (-54 dBm, 501.24 ms), SGBP-604CB06E (-56 dBm, 500.27 ms), SGBP-604CAF0F (-54 dBm, 499.78 ms), SGBP-604CB06F (-61 dBm, -1.0 ms), SGBP-604CB04B (-60 dBm, -1.0 ms), and SGBP-604CAF0B (-65 dBm, -1.0 ms). At the bottom, there are icons for Scanner, RSSI Graph, Advertiser, and Settings.</p> | PASS |

5. 高温存储测试 (High temperature storage test)

测试条件: 关机测试, 让产品储存在 100° C+93%RH 高温下 8hrs, 然后恢复到 85° C+93%RH+93%RH 停留 1hr 后, 做热启动测试。

测试曲线:

Is Power Off ——
Is Power On ——



测试标准:

- 热启动时功能正常, 用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
- 产品测试完后没有可见的损伤, 如收缩、剥离、变色等现象。

| 测试样机 | 测试数据 | 测试结果 |
|------|---|------|
| 6PCS | <p>The screenshot shows a BLE Scanner interface with the following data:</p> <ul style="list-style-type: none"> Device 1: SGBP-604CB074, -54 dBm, 501.24 ms Device 2: SGBP-604CB06E, -56 dBm, 500.27 ms Device 3: SGBP-604CAF0F, -54 dBm, 499.78 ms Device 4: SGBP-604CB06F, -61 dBm, -1.0 ms Device 5: SGBP-604CB04B, -60 dBm, -1.0 ms Device 6: SGBP-604CAF0B, -65 dBm, -1.0 ms | PASS |

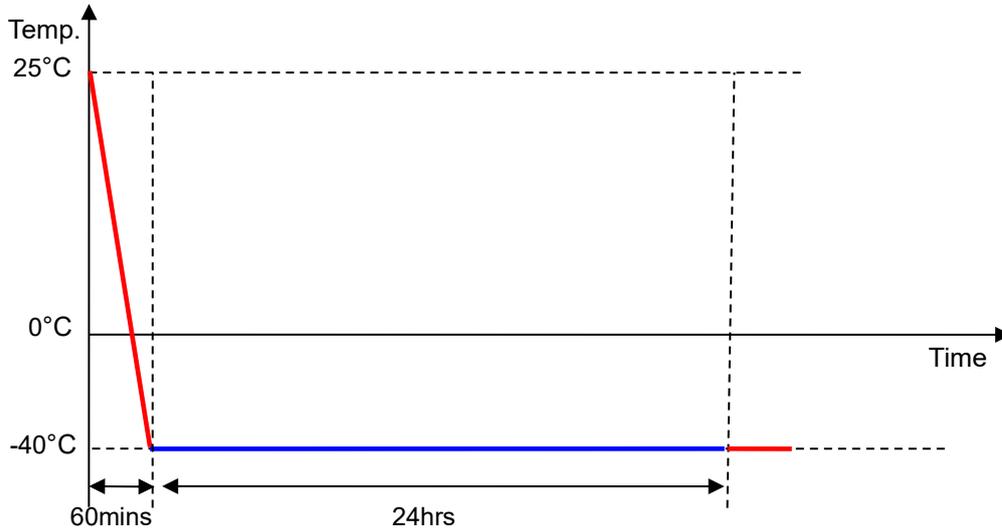
6. 低温运行测试 (Low temperature operation test)

测试条件: 开机测试, 在-40° C下运行24hrs.

测试曲线:

Is Power Off —

Is Power On —



测试标准:

1. 测试过程中用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
2. 产品测试完后没有可见的损伤, 如收缩、剥离、变色等现象。

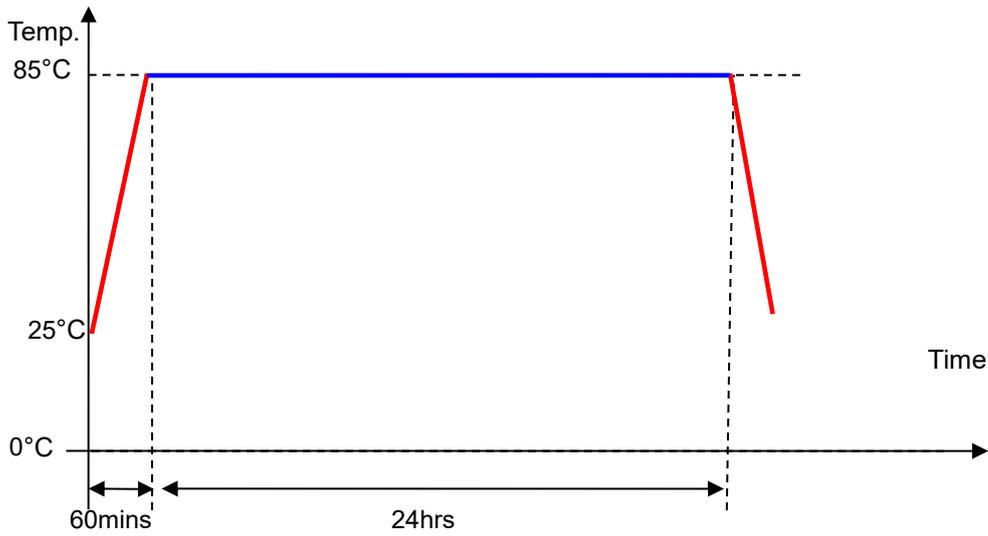
| 测试样机 | 测试数据 | 测试结果 |
|------|---|------|
| 6PCS | <p>The screenshot shows a 'Scanner' app interface with a blue header and 'Stop Scanning' button. Below the header, it says 'Filtering Active (6 / 15)'. There are six device entries, each with a Bluetooth icon, a MAC address, a signal strength indicator, and a connection time. The devices are: SGBP-604CAF0B (-56 dBm, 499.01 ms), SGBP-604CB06E (-59 dBm, 502.77 ms), SGBP-604CAF0F (-53 dBm, -1.0 ms), SGBP-604CB04B (-51 dBm, 1000.5 ms), SGBP-604CB06F (-48 dBm, 500.72 ms), and SGBP-604CB074 (-55 dBm, -1.0 ms). At the bottom, there are icons for Scanner, RSSI Graph, Advertiser, and Settings.</p> | PASS |

7. 高温运行测试 (High temperature operation test)

测试条件: 步骤 85 ° C+93%RH运行24H

测试曲线:

Is Power Off ——
 Is Power On ——



测试标准:

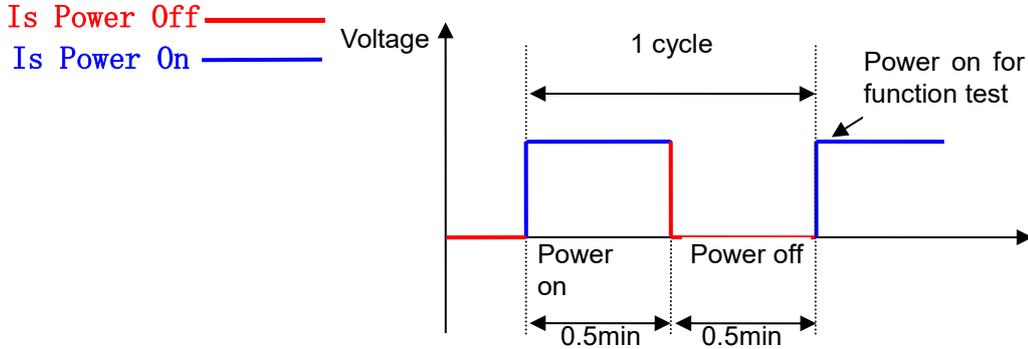
1. 测试过程中用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
2. 产品测试完后没有可见的损伤, 如收缩、剥离、变色等现象。

| 测试样机 | 测试数据 | 测试结果 |
|------|--|------|
| 6PCS | <p>The screenshot shows a mobile application interface for scanning Bluetooth Low Energy (BLE) devices. At the top, there is a 'Stop Scanning' button. Below it, the text 'Scanner' is displayed. A status bar indicates 'Filtering Active (6 / 7)'. The main area lists six discovered devices, each with a unique MAC address and a 'Connect' button. The devices are: SGBP-604CB04B (-56 dBm, 501.66 ms), SGBP-604CAF0F (-54 dBm, -1.0 ms), SGBP-604CB06E (-64 dBm, -1.0 ms), SGBP-604CAF0B (-68 dBm, -1.0 ms), SGBP-604CB074 (-60 dBm, -1.0 ms), and SGBP-604CB06F (-48 dBm, -1.0 ms). At the bottom, there are icons for 'Scanner', 'RSSI Graph', 'Advertiser', and 'Settings'.</p> | PASS |

8. 开关机测试 (AC power on/off test with temperature)

- 测试条件:
1. 开机: 30 秒; 关机: 30 秒。
 2. 温度: -40°C , $25^{\circ}\text{C}+93\%RH$, $85^{\circ}\text{C}+93\%RH$ 。
 3. 循环: 每组测试条件循环 200 次。

测试曲线:



测试标准:

1. 上电工作后用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
2. 产品测试后没有可见的损伤, 如收缩、剥离、变色等。

| 项目 | 测试样机 | 测试数据 | 测试结果 |
|-------|------|------|------|
| 常温开关机 | 6PCS | | PASS |
| 低温开关机 | 6PCS | | PASS |
| 高温开关机 | 6PCS | | PASS |

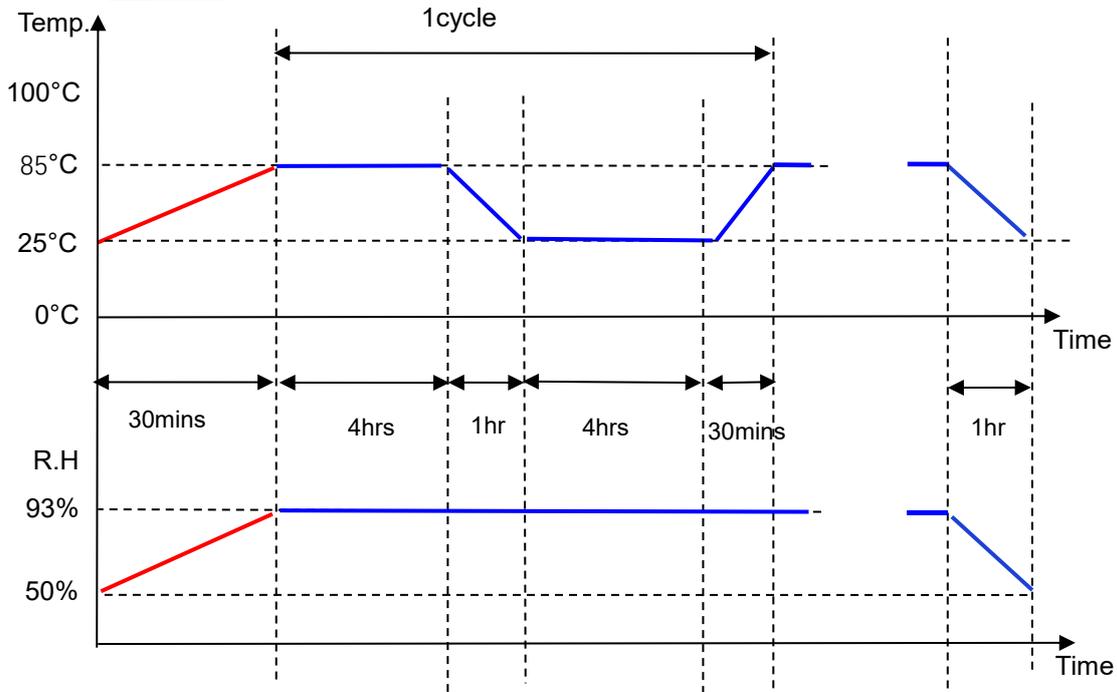
9. 交变湿热测试 (Alternating hot and humid test)

测试条件:

1. 85 ° C+93%RH 运行 4hrs;
 2. 25 ° C+93%RH 运行 4hrs;
- 循环步骤 1 步骤 2 总共 2 个循环.

测试曲线:

Is Power Off



Is Power On

测试标准:

1. 测试过程中用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常.
2. 产品测试后没有可见的损伤, 如收缩、剥离、变色等.

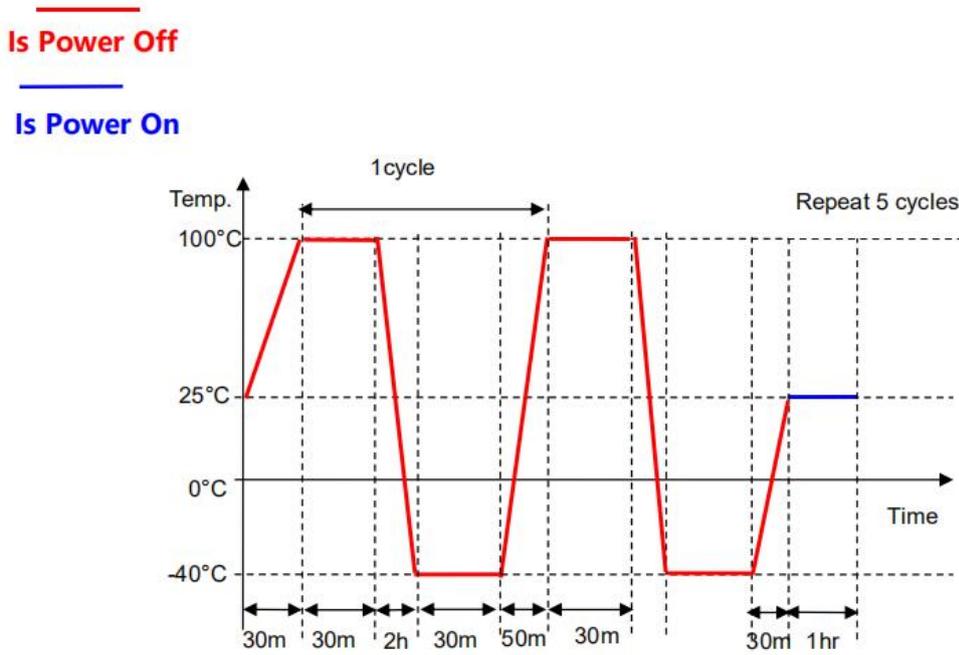
| 测试样机 | 测试数据 | 测试结果 |
|------|------|------|
| 6PCS | | PASS |

10. 冷热冲击测试 (Thermal shock test)

测试条件:

关机测试, $-40^{\circ}\text{C} \sim 100^{\circ}\text{C}+93\%\text{RH}$ 转换, 温度转换时间为升温 50mins, 降温 2hrs. 每个阶段保持 30mins, 运行 5 cycles.

测试曲线:



测试标准:

1. 上电工作后用 BLE 调试助手能够正常搜索到模组蓝牙, 即判定模组功能正常。
2. 产品测试后没有可见的损伤, 如收缩、剥离、变色等。

| 测试样机 | 测试数据 | 测试结果 |
|------|--|------|
| 6PCS | <p>The screenshot shows a mobile application interface titled 'Scanner'. It displays a list of discovered Bluetooth devices. The list includes the following MAC addresses: SGBP-604CB06E, SGBP-604CAF0F, SGBP-604CB04B, SGBP-604CB074, SGBP-604CAF0B, and SGBP-604CB06F. Each entry shows a signal strength indicator (RSSI) and a connection button labeled 'Connect'. The top of the screen has a 'Stop Scanning' button. The bottom navigation bar includes icons for 'Scanner', 'RSSI Graph', 'Advertiser', and 'Settings'.</p> | PASS |